



Federal Aviation  
Administration

# Commercial Space Transportation 2013 Year in Review



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Sloan  
2014



### About the FAA Office of Commercial Space Transportation

The Federal Aviation Administration's Office of Commercial Space Transportation (FAA AST) licenses and regulates U.S. commercial space launch and reentry activity, as well as the operation of non-federal launch and reentry sites, as authorized by Executive Order 12465 and Title 51 United States Code, Subtitle V, Chapter 509 (formerly the Commercial Space Launch Act). FAA AST's mission is to ensure public health and safety and the safety of property while protecting the national security and foreign policy interests of the United States during commercial launch and reentry operations.

In addition, FAA AST is directed to encourage, facilitate, and promote commercial space launches and reentries. Additional information concerning commercial space transportation can be found on FAA AST's website:

<http://www.faa.gov/go/ast>

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## EXECUTIVE SUMMARY

The Commercial Space Transportation: 2013 Year in Review summarizes U.S. and international orbital launch activities for calendar year 2013, including launches licensed by the Federal Aviation Administration's Office of Commercial Space Transportation (FAA AST).

In 2013, the United States, Russia, Europe, China, Japan, India, South Korea, and multinational provider Sea Launch conducted a total of 81 orbital launches, 23 of which were commercial (See Figure 1). In 2012 there were 78 launches, including 20 commercial launches. Three of the 81 launches failed; two government launches, China's Long March 4B launch of CBERS and Russia's Proton M launch of Glonass M46, 48, and 49 satellites, and, one commercial launch, Sea Launch's Zenit 3SL launch of Intesat 27.

Highlights of 2013 in the orbital space launch industry:

- The United States performed six commercial orbital launches. 2008 was the last time the U.S. had six commercial launches;
- SpaceX performed the first U.S. commercial communication satellite launch to geosynchronous transfer orbit (GTO) in five years;
- The new U.S. Antares launch vehicle, built by Orbital Sciences Corporation, performed a successful inaugural flight and enabled a successful Cygnus resupply mission to the International Space Station (ISS) on its second launch;
- The successful Antares/Cygnus mission to the ISS marked the conclusion of the NASA Commercial Orbital Transportation Services (COTS) program, the subsequent commercial ISS resupply missions will be under NASA Commercial Resupply Services (CRS) program;
- In addition to Antares, four more new orbital launch vehicles were successfully introduced worldwide, including the Minotaur V by Orbital (United States), the Kuaizhou (China), the Epsilon by Mitsubishi Heavy Industries (Japan), and the Soyuz 2.1v (Russia);
- The U.S. launch provider United Launch Alliance (ULA) had its busiest year to date with 11 missions, launching 8 Atlas V and 3 Delta IV rockets;
- Two robotic missions to Mars were successfully launched and sent on their interplanetary journeys: NASA's Mars Atmosphere and Volatile Evolution (MAVEN) launched by Atlas V and an Indian Mars Orbiter Mangalyaan launched by PSLV, both in November 2013;
- Two lunar missions were successfully launched, the NASA Lunar Atmosphere and Dust Environment Explorer (LADEE) mission launched by a Minotaur V and the Chinese Chang'e 3 lander and rover mission launched by a Long March 3B;

- Record number of 92 cubesat class satellites were launched, including 59 cubesats on 2 launch vehicles launched 30 hours apart. Those missions were a U.S. Air Force mission on Minotaur I and a Russian Dnepr mission, both launched in November.

Revenues from the 23 commercial orbital launches in 2013 were estimated to be about \$1.9 billion. These revenues are consistent with commercial launch revenue in 2011 but show nearly half-billion dollar lower results than in 2009, 2010, and 2012. The United States estimated commercial orbital launch revenues of \$339.5 million were the highest in the last five-year (See Figure 2).

FAA AST licensed seven commercial orbital launches in 2013, compared to five licensed launches in 2012. SpaceX's Falcon 9 vehicle had three licensed launches: one in March, under NASA's CRS program, one for the Canadian Space Agency (CSA) in September, and one for satellite operator SES in December. Orbital's Antares was used for two FAA-licensed launches, its inaugural launch in April, and an ISS resupply mission in September. Orbital's Minotaur I performed a successful FAA-licensed launch under the U.S. Air Force Operationally Responsive Space (ORS) program. Sea Launch's Zenit 3SL failed launch of Intelsat 27 was an FAA-licensed launch.

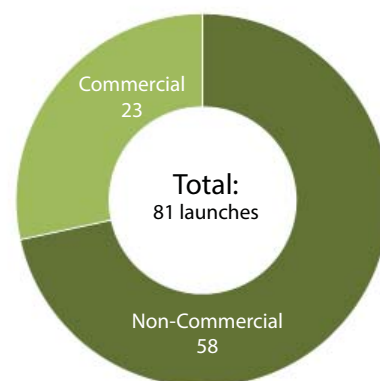


Figure 1. 2013 Total Worldwide Launch Activity

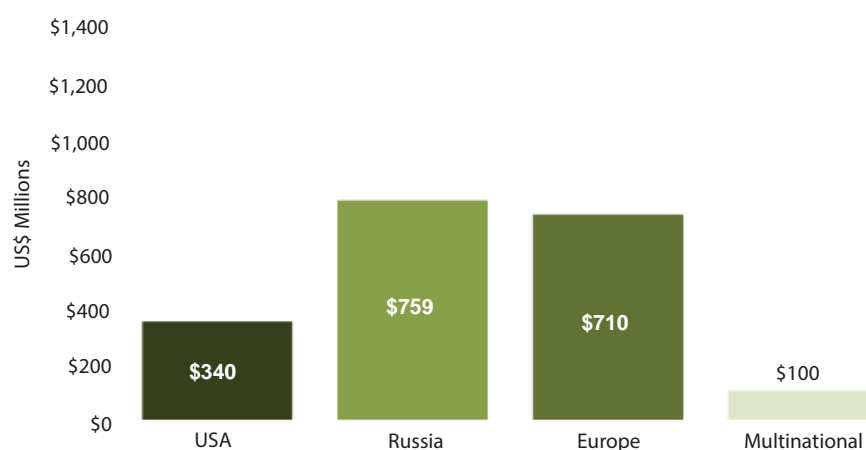


Figure 2. Estimated 2013 Commercial Launch Revenues

## 2013 LAUNCH ACTIVITY

### WORLDWIDE ORBITAL LAUNCH ACTIVITY

Launch providers from the United States, Russia, Europe, China, Japan, India, South Korea, and one multinational provider conducted a total of 81 launches in 2013, 23 of which were commercial (see Figure 3 and Tables 1 and 2). This is higher than the previous 5-year average of 77 total launches and 21 commercial launches per year. The following is a summary of worldwide orbital commercial launches in 2013, by country.

- The United States conducted 19 launches in 2013, 6 more launches than in 2012. Six of the 19 launches were commercial, 4 more than in 2012.
- Russia had the most total launches (32) as well as the most commercial launches (12). This is 8 more launches than Russia had in 2012, with 24 total launches, 7 of which were commercial. Russia experienced one failure of a Proton M launch vehicle while attempting to launch three Glonass satellites for the Russian national satellite navigation system.
- Europe conducted 7 launches in 2013, 4 of which were commercial, a drop from 10 total launches, 6 of which were commercial in 2012.
- China had 15 orbital launches, all non-commercial, a drop from 19, including two commercial launches in 2012.
- The multinational Sea Launch Zenit 3SL launch vehicle performed one failed launch attempt in 2013. In 2012, there were three successful commercial launches by Sea Launch.
- India and Japan each had three non-commercial launches, a slight increase from two launches each in 2012.
- South Korea successfully launched Naro-1 (KSLV-1) launch vehicle. It was the rocket's first successful launch after two failed launch attempts in 2009 and 2010.
- There were 11 commercial launches of GEO satellites in 2013, four launches less than in 2012 and the lowest number since 2007.

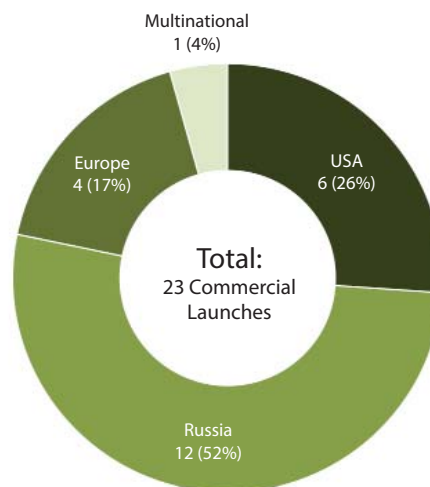


Figure 3. 2013 Worldwide Commercial Launch Activity

Country/Region	Commercial Launches	Non-Commercial Launches	Launches
United States	6	13	19
Russia	12	20	32
Europe	4	3	7
China	0	15	15
Japan	0	3	3
India	0	3	3
South Korea	0	1	1
Multinational	1	0	1
<b>TOTAL</b>	<b>23</b>	<b>58</b>	<b>81</b>

Table 1. 2013 Worldwide Orbital Launch Events

Date	Launch Vehicle	Launching Country/Region	Primary Payload Name	Orbit	Launch Outcome
2/1/2013	Zenit 3SL	Multinational	Intelsat 27	GEO	Failure
2/6/2013	Soyuz 2.1a	Russia	Globalstar 2nd Gen 19	LEO	Success
2/7/2013	Ariane 5 ECA	Europe	Amazonas 3	GEO	Success
3/1/2013	Falcon 9 v1.0 Dragon	USA	Dragon ISS 2D	LEO	Success
3/26/2013	Proton M/Breeze-M	Russia	SatMex 8	GEO	Success
4/15/2013	Proton M/Breeze-M	Russia	Anik G1	GEO	Success
4/21/2013	Antares 120	USA	Cygnus Mass Simulator	LEO	Success
5/14/2013	Proton M/Breeze-M	Russia	Eutelsat 3D	GEO	Success
6/3/2013	Proton M/Breeze-M	Russia	SES 6	GEO	Success
6/25/2013	Soyuz 2.1b	Europe	O3b 01	MEO	Success
7/25/2013	Ariane 5 ECA	Europe	Alphasat I-XL	GEO	Success
8/22/2013	Dnepr	Russia	Kompsat 5	SSO	Success
8/29/2013	Ariane 5 ECA	Europe	Eutelsat 25B	GEO	Success
9/1/2013	Zenit 3SLB	Russia	Amos 4	GEO	Success
9/18/2013	Antares 120	USA	Cygnus COTS Demo	LEO	Success
9/29/2013	Falcon 9 v1.1	USA	Cassiope	LEO	Success
9/30/2013	Proton M/Breeze-M	Russia	Astra 2E	GEO	Success
10/25/2013	Proton M/Breeze-M	Russia	Sirius FM-6	GEO	Success
11/19/2013	Minotaur I	USA	STPSAT-3	LEO	Success
11/21/2013	Dnepr	Russia	DubaiSat 2	SSO	Success
11/22/2013	Rockot	Russia	Swarm 1	LEO	Success
12/3/2013	Falcon 9 v1.1	USA	SES-8	GEO	Success
12/8/2013	Proton M/Breeze-M	Russia	Inmarsat 5-F1	GEO	Success

Table 2. 2013 Worldwide Commercial Launch Events

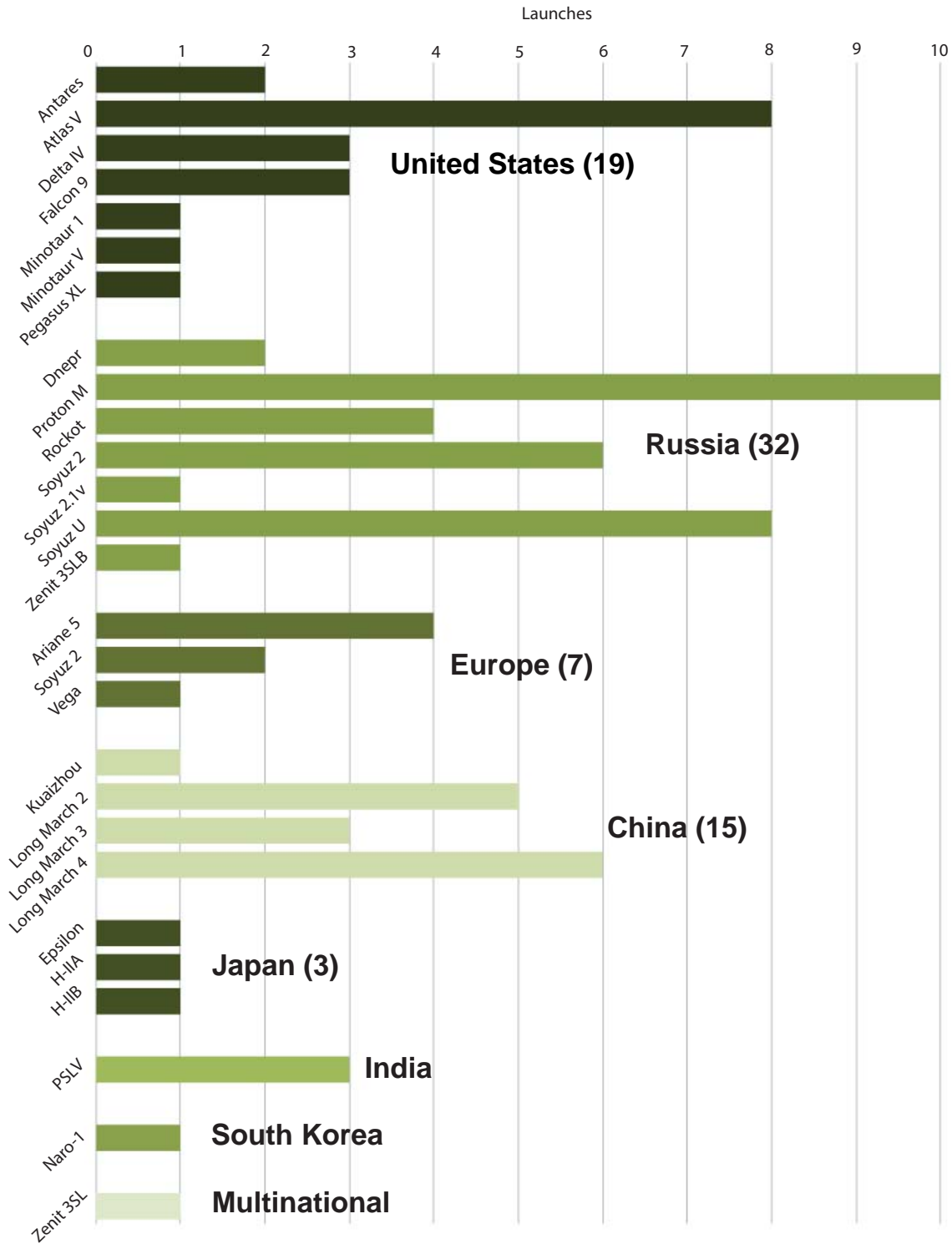


Figure 4. 2013 Launch Vehicle Use



## Worldwide Launch Revenues

Estimated revenues from the 23 commercial launch events in 2013 amounted to approximately \$1.9 billion. These revenues are consistent with commercial launch revenue in 2011 but show nearly half-billion dollar lower results than in 2009, 2010, and 2012. The following are 2013 revenues by country:

- Commercial launch revenues in the United States amounted to \$339.5 million, the highest in the last five years. Estimated commercial launch revenue for 2012 was \$108 million.
- Russian commercial launch revenues were approximately \$759 million, up 22 percent from last year. The Proton returned to flight quickly after the July failure. This minimized slips of commercial launches to 2014.
- European commercial launch revenues were approximately \$710 million, a 54 percent drop from 2012.
- China did not perform any commercial launches in 2013, while it had earned an estimated total of \$90 million for its two commercial launches in 2012.
- Multinational (Sea Launch) revenues from its single 2013 launch were estimated as \$100 million, down from \$300 million in 2012.

Payments for launch services are typically spread over one to two years before the launch, but for the purposes of this report, revenue is counted in the year a customer's payload launches. Launch revenues are attributed to the country or region where the primary vehicle manufacturer is based. These revenues are assessed based on commercial launch price estimates for each launch vehicle using publically available information.

<sup>1</sup> International Launch Services (ILS) and Arianespace constitute an exception. ILS is a Russian-owned company incorporated in the United States and selling launches of the Russian Proton vehicles. Arianespace markets launches of a Russian-manufactured Soyuz 2 vehicle from the Kourou launch site in French Guiana.

## U.S. AND FAA-LICENSED ORBITAL LAUNCH AND REENTRY ACTIVITY

### FAA-Licensed Orbital Launch Summary

There were seven FAA-licensed orbital launches in 2013 (see Table 3) from four different launch sites.

SpaceX's Falcon 9 vehicle made three licensed launches: a CRS mission to the ISS, launch of a Canadian Space Agency (CSA) satellite from Vandenberg Air Force Base (VAFB), and an SES commercial telecommunications satellite.

Orbital's Antares had two FAA-licensed launches, the inaugural launch in April, and the second launch under NASA's COTS program in September from Mid-Atlantic Regional Spaceport (MARS).

Date	Vehicle	Primary Payload	Orbit	Launch Outcome
1-Feb-13	Zenit 3SL	Intelsat 27	GEO	Failure
1-Mar-13	Falcon 9	Dragon CRS	LEO	Success
21-Apr-13	Antares	Cygnus Mass Simulator	LEO	Success
18-Sep-13	Antares	Cygnus COTS Demo	LEO	Success
29-Sep-13	Falcon 9	Cassiope	LEO	Success
19-Nov-13	Minotaur I	STPSAT-3	LEO	Success
3-Dec-13	Falcon 9	SES-8	GEO	Success

Table 3. 2013 FAA-Licensed Orbital Launch Events

A Minotaur I, also provided by Orbital, performed a successful FAA-licensed launch under the U.S. Air Force ORS program.

Sea Launch's Zenit 3SL vehicle performed one FAA-licensed launch attempt that resulted in a failure and the loss of a commercial telecommunications satellite Intelsat 27.

Over the past five years (in 2009–2013), FAA has on average licensed about four launches per year. However, in 2008, FAA licensed 11 launches, including 5 Sea Launch Zenit 3SL launches of commercial GEO communications satellites. With the Zenit 3SL grounded after the launch failure and more U.S. vehicles performing commercial launches, the increase in licensed launches is predominantly by U.S. launch organizations. SpaceX and Orbital plan 10 to 15 licensed launches in 2014, Sea Launch plans one launch in 2014. Figures 5 and 6 summarize the number of FAA-licensed orbital launches and revenue in 2009–2013.

### United States

U.S. launch vehicles provided 13 U.S. government launches and 6 commercial launches in 2013. Of the 13 government launches, 5 were for NASA and 8 were for DoD. The three commercial SpaceX and Orbital launches to the ISS and the U.S. Air Force ORS-3 mission on the Minotaur I were all licensed by the FAA and therefore counted as commercial launches. Table 4 on page 16 summarizes U.S. and FAA-licensed launch vehicles active in 2013.

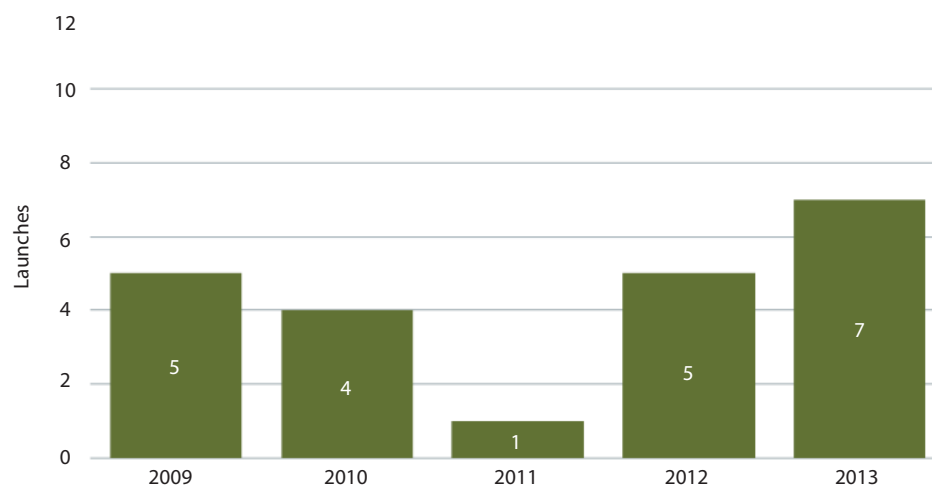


Figure 5 FAA-licensed Orbital Launch Events, 2009-2013

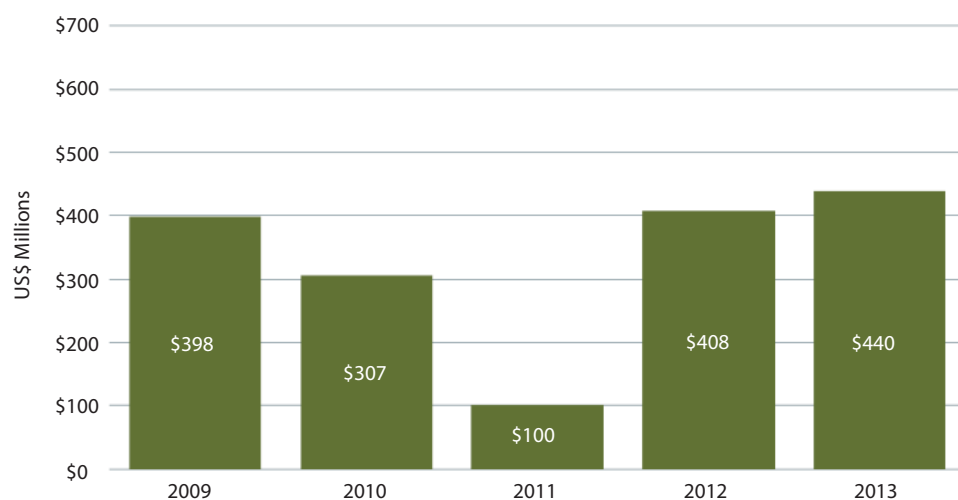


Figure 6. Estimated Revenue for FAA-licensed Orbital Launch Events, 2009-2013

The following is a list of U.S.-based launch service providers, highlighting their launch activity in 2013. It includes all companies that launch from the United States or under the regulatory oversight of the FAA AST.

#### Orbital Sciences Corporation

Orbital provides the Antares, Minotaur, Pegasus, and Taurus vehicles for orbital launch.

Orbital performed five launches in 2013. Its new Antares launch vehicle performed a successful inaugural flight in April and enabled a successful Cygnus resupply mission to the ISS in its second launch in September. In June, a Pegasus XL launched NASA's IRIS payload from Kwajalein Island. In September, Orbital's new vehicle from the Minotaur family, Minotaur V, launched

the NASA lunar probe LADEE. Another Minotaur vehicle, Minotaur I, launched a U.S. Air Force primary payload STPSAT-3 and 28 cubesat class satellites for several government civil, military, and non-profit missions.

#### Space Exploration Technologies Corporation

SpaceX performed three commercial Falcon 9 launches in 2013. In March, Falcon 9 v1.0 launched the Dragon capsule carrying supplies to the ISS. This mission was performed under NASA's CRS program. In September, the company launched the Cassiope remote sensing mission for CSA, and in December deployed a commercial telecommunications satellite SES-8 to geosynchronous transfer orbit (GTO). The latter two launches were performed by a new version of the Falcon 9 rocket, Falcon 9 v1.1

#### United Launch Alliance

ULA manufactures and operates Boeing-heritage Delta vehicles and Lockheed Martin-heritage Atlas vehicles. ULA is a partnership between Boeing and Lockheed Martin. In 2013, ULA conducted a record number of 11 non-commercial U.S. government launches.

Delta IV vehicles placed three DoD payloads into orbit: WGS 5, WGS 6, and NRO L-65. Atlas V vehicles placed eight primary payloads, five for DoD, three for NASA (including one jointly with the U.S. Geological Survey) into orbit: SBIRS GEO 2, Navstar GPS 2F-04, MUOS 2, AEHF 3, NRO L-39, TDRS K, MAVEN, and Landsat DCM.

#### FAA-Licensed Multinational Launches: Sea Launch AG

Zenit 3SL, a launch vehicle operated by multinational commercial launch provider Sea Launch AG, attempted to deploy one commercial GEO communications satellite for commercial operator Intelsat. The launch attempt resulted in a failure.

Vehicle	Pegasus XL	Delta IV Medium+ (5,4)	Delta IV Heavy	Atlas V 401	Atlas V 501	Atlas V 531	Atlas V 551	Antares 120	Minotaur I	Minotaur V	Falcon 9 v1.0	Falcon 9 v1.1	Zenit 3SL
2013 Total Launches	1	2	1	5	1	1	1	2	1	1	1	2	1
2013 Licensed Launches	0	0	0	0	0	0	0	2	1	0	1	2	1
Launch Reliability (Last 10 Years)	1/1 100%	2/2 100%	1/1 100%	5/5 100%	1/1 100%	1/1 100%	1/1 100%	2/2 100%	1/1 100%	1/1 100%	1/1 100%	2/2 100%	0/1 0%
Launch Reliability (Last 10 Years)	8/8 100%	4/4 100%	6/7 86%	18/18 100%	5/5 100%	3/3 100%	4/4 100%	2/2 100%	11/11 (100%)	1/1 100%	5/5 100%	2/2 100%	23/25 92%
Year of First Launch	1994	2009	2004	2002	2010	2011	2006	2013	2000	2013	2010	2013	1999
Active Launch Sites	CCAFS, Kwajalein, VAFB	CCAFS, VAFB	CCAFS, VAFB	CCAFS, VAFB	CCAFS, VAFB	CCAFS, VAFB	CCAFS, VAFB	MARS	CCAFS, VAFB, MARS, KLC	MARS	CCAFS	CCAFS, VAFB	Odyssey Pacific Ocean Platform
LEO kg (lbs)	450 (992)	13,774 (30,365)	22,560 (49,740)	9,797 (21,598)	8,123 (17,908)	15,575 (34,337)	18,814 (41,478)	4,900 (10,780)	580 (1,279)	--	9,000 (19,842)	13,150 (28,991)	--
GTO kg (lbs)	--	7,434 (16,389)	14,420 (31,791)	4,750 (10,470)	3,775 (8,320)	7,475 (16,470)	8,900 (19,620)	--	--	640 (1,411)	--	4,850 (10,692)	6,160 (13,580)

Table 4. U.S. and FAA-Licensed Launch Vehicles Active in 2013



## FAA Reentry License Summary

There was one reentry conducted under an FAA reentry license in 2013. SpaceX's Dragon spacecraft performed the licensed reentry, in March 2013, completing its second CRS mission to the ISS. (See Table 5 for details.)



## FAA Suborbital Launch Summary

Suborbital launches carried out under FAA licenses or experimental permits are listed in Table 6.

- Armadillo Aerospace's STIG-B vehicle made an FAA-licensed suborbital flight from Spaceport America. Later in the year the company announced it was going on hiatus;
- Virgin Galactic's SpaceShipTwo performed two successful powered flight tests authorized under an FAA experimental permit; and
- SpaceX performed five successful suborbital launches of its Grasshopper vertical takeoff vertical landing (VTVL) rocket authorized under an FAA Experimental Permit. These flights were part of a test program leading to the development of a reusable first stage for the Falcon 9 orbital launch vehicle.

Other highlights of the suborbital vehicle development activities include:

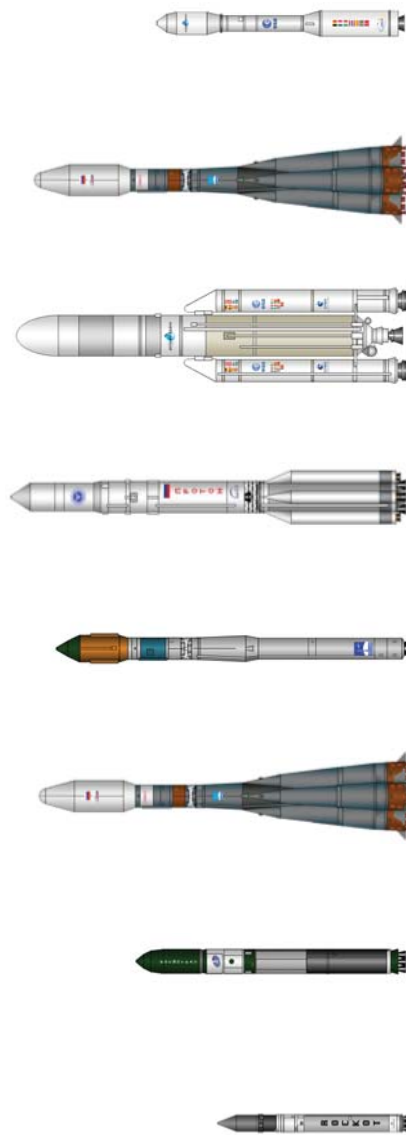
- Masten Space Systems' XA-0.1B "Xombie" completed an 80-second flight to test for NASA featuring a closed-loop planetary Guidance, Navigation and Control system as prototype landing instruments for future missions to the Moon or Mars; and
- Blue Origin tested its BE-3 liquid-hydrogen rocket engine at its facility in Van Horn, Texas. This engine will be used for the company's suborbital vehicle, New Shepard, and ultimately for its orbital vehicle.

Vehicle	SpaceX Dragon
2013 Total Reentries	1
2013 Licensed Reentries	1
Launch Reliability (2013)	1/1 100%
Reentry Reliability (Last 10 Years)	4/4 100%
Year of First Reentry	2010
Reentry Sites	Pacific Ocean
Payload to LEO, kg (lbs)	6,000 (13,228)
Payload from LEO, kg (lbs)	3,000 (6,614)

Table 5. FAA-Licensed Reentry Vehicles Active in 2013

Operator	Type of FAA Authorization	Launch Date	Vehicle
Armadillo Aerospace	Launch Operator License (LRLO 12-080)	5-Jan	STIG-B
Scaled Composites	Experimental Permit (EP 12-007)	29-Apr 5-Sep	SpaceShipTwo
SpaceX	Experimental Permit (EP 12-008)	7-Mar 19-Apr 14-Jun 13-Aug 7-Oct	Grasshopper

Table 6. FAA 2013 Suborbital License and Permit Flight Summary



Vehicle	Rockot	Dnepr	Soyuz 2	Soyuz 2.1v	Proton M	Ariane 5 ECA	Soyuz 2	Vega
Country/Region	Russia	Russia	Russia	Russia	Russia	Europe	Europe	Europe
2013 Total Launches	4	2	5	1	10	4	2	1
Launch Reliability (2013)	4/4 100%	2/2 100%	5/5 100%	1/1 100%	9/10 90%	4/4 100%	2/2 100%	1/1 100%
Launch Reliability (Last 10 Years)	17/18 94%	6/6 100%	17/19 89%	1/1 100%	69/77 90%	38/39 97%	6/6 100%	2/2 100%
Year of First Launch	1994	2010	2004	2013	2001	2002	2011	2012
Active Launch Sites	Baikonur, Plesetsk	Baikonur, Dombrovsky	Baikonur, Plesetsk	Baikonur, Plesetsk	Baikonur	Kourou	Kourou	Kourou
LEO kg (lbs)	2,150 (4,740)	3,700 (8,157)	4,850 (10,692)	3,000 (6,614)	23,000 (50,706)	21,000 (46,297)	4,850 (10,692)	2,300 (5,071)
GTO kg (lbs)	---	---	1,700 (3,800)	1,400 (3,086)	6,920 (15,256)	9,500 (20,944)	3,250 (7,165)	---

Table 7. Non-U.S. Commercially Available Launch Vehicles Active in 2013









Vehicle								
Country/Region	China	China	China	Japan	Japan	Japan	India	India
2013 Total Launches	2	2	3	1	1	1	1	1
Launch Reliability (2013)	2/2 100%	2/2 100%	3/3 100%	1/1 100%	1/1 100%	1/1 100%	1/1 100%	1/1 100%
Launch Reliability (Last 10 Years)	18/19 95%	17/17 100%	21/21 100%	20/21 95%	3/3 100%	1/1 100%	3/3 100%	2/2 100%
Year of First Launch	1975	1992	1996	2001	2009	2013	2009	2012
Active Launch Sites	Jiuquan, Taiyuan, Xichang	Jiuquan	Xichang	Tanegashima	Tanegashima	Uchinoura	Satish Dhawan	Satish Dhawan
LEO kg (lbs)	3,850 (8,488)	1,300 (2,866)	--	10,000 (23,046)	16,500 (36,376)	1,200 (2,646)	2,100 (4,630)	1,800 (3,968)
GTO kg (lbs)	1,250 (2,756)	--	5,100 (11,244)	6,000 (13,228)	8,000 (17,600)	--	--	1,140 (2,513)

Table 7. Non-U.S. Commercially Available Launch Vehicles Active in 2013 (continued)

## 2013 WORLDWIDE ORBITAL LAUNCH EVENTS

Date	Vehicle	Site	Payload(s)	Orbit	Operator	Manufacturer	Use	Comm'l Price	L	M
15-Jan-13	Rockot	Plesetsk	Cosmos 2482	LEO	Russian Space Forces (VKS)	Reshetnev Company	Communications		S	S
			Cosmos 2483	LEO	Russian Space Forces (VKS)	Reshetnev Company	Communications		S	
			Cosmos 2484	LEO	Russian Space Forces (VKS)	Reshetnev Company	Communications		S	
27-Jan-13	H-IIA 202	Tanegashima	IGS-4D (RADAR)	SSO	Japan Defense Agency	Mitsubishi Electric Corp.	Intelligence		S	S
			IGS-5 Optical Demonstration	SSO	Japan Defense Agency	Mitsubishi Electric Corp.	Intelligence		S	
30-Jan-13	Naro-1	Naro Space Center	STSAT-2C	LEO	KARI	Korean Advanced Institute of Science and Technology	Scientific		S	S
30-Jan-13	Atlas V 401	CCAFS	TDRS K	GEO	NASA	The Boeing Company	Communications		S	S
1-Feb-13	✓	Zenit 3SL	* Intelsat 27	GEO	Intelsat	Boeing Satellite Systems	Communications	\$100M	F	F
6-Feb-13	✓	Soyuz 2.1a	* Globalstar 2nd Gen 19	LEO	Globalstar, Inc.	Thales Alenia Space	Communications	\$50M	S	S
			* Globalstar 2nd Gen 20	LEO	Globalstar, Inc.	Thales Alenia Space	Communications		S	
			* Globalstar 2nd Gen 21	LEO	Globalstar, Inc.	Thales Alenia Space	Communications		S	
			* Globalstar 2nd Gen 22	LEO	Globalstar, Inc.	Thales Alenia Space	Communications		S	
			* Globalstar 2nd Gen 23	LEO	Globalstar, Inc.	Thales Alenia Space	Communications		S	
			* Globalstar 2nd Gen 24	LEO	Globalstar, Inc.	Thales Alenia Space	Communications		S	
7-Feb-13	✓	Ariane 5 ECA	* Amazonas 3	GEO	Hispatat	Space Systems/Loral	Communications	\$220M	S	S
			Azersat 1	GEO	Government of Azerbaijan	Orbital Sciences Corp.	Communications		S	
11-Feb-13		Soyuz U2/Progress	Progress M-18M	LEO	Russian Federal Space Agency (Roscosmos)	RKK Energia	ISS		S	S
11-Feb-13		Atlas V 401	Landsat DCM	SSO	NASA/U.S. Geological Survey	Orbital Sciences Corp.	Remote Sensing		S	S
25-Feb-13		PSLV Standard	Saral	SSO	ISRO	ISRO	Remote Sensing		S	S
			6 secondary payloads (including cubesats)						S	
1-Mar-13	✓ +	Falcon 9 v1.0 Dragon	* Dragon ISS 2D	LEO	Space Exploration Technologies	Space Exploration Technologies	ISS	\$56.5M	S	S
19-Mar-13		Atlas V 401	SBIRS GEO 2	GEO	U.S. Air Force	Lockheed Martin Corp.	Early Warning		S	S
26-Mar-13	✓	Proton M/Breeze-M	* SatMex 8	GEO	Satelites Mexicanos S.A. de C.V.	Space Systems/Loral	Communications	\$85M	S	S
28-Mar-13		Soyuz U2/Soyuz	Soyuz TMA-08M	LEO	Russian Federal Space Agency (Roscosmos)	RKK Energia	Crewed		S	S
15-Apr-13	✓	Proton M/Breeze-M	* Anik G1	GEO	Telesat	Space Systems/Loral	Communications	\$85M	S	S
19-Apr-13		Soyuz 2.1a	Bion M1	LEO	Russian Federal Space Agency (Roscosmos)	TsSKB Progress	Scientific		S	S
			6 secondary payloads (including cubesats)						S	
21-Apr-13	✓ +	Antares 120	* Cygnus Mass Simulator	LEO	Orbital Sciences Corp.	Orbital Sciences Corp.	Test	\$77.5M	S	S
			4 secondary payloads (including cubesats)						S	
24-Apr-13		Soyuz U2/Progress	Progress M-19M	LEO	Russian Federal Space Agency (Roscosmos)	RKK Energia	ISS		S	S

Date	Vehicle	Site	Payload(s)	Orbit	Operator	Manufacturer	Use	Comm'l Price	L	M
26-Apr-13	Long March 2D	Jiuquan	GAOFEN 1	SSO	China Aerospace Science and Technology Corporation (CASC)	China Aerospace Science and Technology Corporation (CASC)	Remote Sensing		S	S
			3 secondary payloads (including cubesats)							S
26-Apr-13	Soyuz 2.1b	Plesetsk	Glonass M47	MEO	Russian Space Forces (VKS)	Reshetnev Company	Navigation		S	S
1-May-13	Long March 3B	Xichang	* Chinasat 11 (Sinosat 7)	GEO	China Direct Broadcast Satellite Co., Ltd (CHINA DBSAT)	Aerospace Dongfanghong Satellite Company	Communications		S	S
6-May-13	Vega	Kourou	Proba-V	SSO	European Space Agency	QINETIQ	Remote Sensing		S	S
			VNREDSat 1A	SSO	Vietnam Academy of Science & Technology	EADS Astrium	Remote Sensing			S
			ESTCube 1	SSO	Tartu University	Tartu University	Development			S
14-May-13	✓ Proton M/Breeze-M	Baikonur	* Eutelsat 3D	GEO	Eutelsat	Thales Alenia Space	Communications	\$85M	S	S
15-May-13	Atlas V 401	CCAFS	Navstar GPS 2F-04	MEO	U.S. Air Force	The Boeing Company	Navigation		S	S
24-May-13	Delta IV Medium+ (5,4)	CCAFS	WGS 5	GEO	U.S. Air Force	Boeing Satellite Systems	Communications		S	S
28-May-13	Soyuz U2/Soyuz	Baikonur	Soyuz TMA-09M	LEO	Russian Federal Space Agency (Roscosmos)	RKK Energia	Crewed		S	S
3-Jun-13	✓ Proton M/Breeze-M	Baikonur	* SES 6	GEO	SES World Skies	EADS Astrium	Communications	\$85M	S	S
5-Jun-13	Ariane 5 ES	Kourou	ATV 4	LEO	European Space Agency	EADS Astrium	ISS		S	S
7-Jun-13	Soyuz 2.1b	Plesetsk	Cosmos Persona	SSO	Russian Space Forces (VKS)	RKK Energia	Intelligence		S	S
11-Jun-13	Long March 2F	Jiuquan	Shenzhou 10 Orbital Module	LEO	China Aerospace Science and Technology Corporation (CASC)	China Academy of Space Technology (CAST)	Development		S	S
			Shenzhou 10 Descent Module	LEO	China Aerospace Science and Technology Corporation (CASC)	China Academy of Space Technology (CAST)	Crewed			S
25-Jun-13	✓ Soyuz 2.1b	Kourou	* O3b 01	MEO	O3b Networks	Thales Alenia Space	Communications	\$50M	S	S
			* O3b 02	MEO	O3b Networks	Thales Alenia Space	Communications			S
			* O3b 03	MEO	O3b Networks	Thales Alenia Space	Communications			S
			* O3b 04	MEO	O3b Networks	Thales Alenia Space	Communications			S
25-Jun-13	Soyuz 2.1b	Baikonur	Resurs P1	SSO	Russian Federal Space Agency (Roscosmos)	Khrunichev State Research and Production Space Center	Remote Sensing		S	S
27-Jun-13	Strela	Baikonur	Kondor E	LEO	NPO Machinostroyeniya	NPO Machinostroyeniya	Remote Sensing		S	S
27-Jun-13	Pegasus XL	VAFB	IRIS (USA)	SSO	NASA	Lockheed Martin Corp.	Scientific		S	S
1-Jul-13	PSLV XL	Satish Dhawan	IRNSS 1A	GEO	ISRO	ISRO	Navigation		S	S
2-Jul-13	Proton M/Block DM	Baikonur	Glonass M46	MEO	Russian Space Forces (VKS)	Reshetnev Company	Navigation		F	F
			Glonass M48	MEO	Russian Space Forces (VKS)	Reshetnev Company	Navigation			F
			Glonass M49	MEO	Russian Space Forces (VKS)	Reshetnev Company	Navigation			F
15-Jul-13	Long March 2C	Jiuquan	Shi Jian 11-05	SSO	China Academy of Space Technology (CAST)	Aerospace Dongfanghong Satellite Company	Scientific		S	S
19-Jul-13	Long March 4C	Taiyuan	Chuang Xin-3	SSO	China - TBA	China - TBA	Communications		S	S
			Shiyan Weixing-7	SSO	China - TBA	China - TBA	Scientific			S
			Shi Jian-15	SSO	China - TBA	China - TBA	Scientific			S



Date	Vehicle		Site	Payload(s)	Orbit	Operator	Manufacturer	Use	Comm'l Price	L	M
19-Jul-13	Atlas V 551		CCAFS	MUOS 2	GEO	US Navy	Lockheed Martin Commercial Space Systems	Communications		S	S
25-Jul-13	✓	Ariane 5 ECA	Kourou	* Alphasat I-XL	GEO	Inmarsat	EADS Astrium	Communications	\$220M	S	S
				* Insat 3D	GEO	ISRO	ISRO	Meteorological			S
27-Jul-13	Soyuz U2/Progress		Baikonur	Progress M-20M	LEO	Russian Federal Space Agency (Roscosmos)	RKK Energia	ISS		S	S
3-Aug-13	H-II/B		Tanegashima	HTV-4	LEO	JAXA	Mitsubishi Electric Corp.	ISS		S	S
7-Aug-13	Delta IV Medium+ (5,4)		CCAFS	WGS 6	GEO	U.S. Air Force	Boeing Satellite Systems	Communications		S	S
22-Aug-13	✓	Dnepr	Dombarovskiy	Kompsat 5	SSO	KARI	KARI	Remote Sensing	\$12M	S	S
28-Aug-13	Delta IV Heavy		VAFB	NRO L-65	TBD	NRO	Classified	Classified		S	S
29-Aug-13	✓	Ariane 5 ECA	Kourou	* Eutelsat 25B	GEO	Eutelsat	Space Systems/Loral	Communications	\$220M	S	S
				GSAT-7 (Insat 4F)	GEO	Indian Ministry of Defense	ISRO	Communications			S
1-Sep-13	✓	Zenit 3SLB	Baikonur	* Amos 4	GEO	SpaceCom Limited	Israel Aerospace Industries	Communications	\$60M	S	S
2-Sep-13	Long March 4C		Jiuquan	Yaogan 17 Main	LEO	People's Liberation Army (PLA)	China Academy of Space Technology (CAST)	Remote Sensing		S	S
				Yaogan 17 Subsat 1	LEO	People's Liberation Army (PLA)	China Academy of Space Technology (CAST)	Remote Sensing			S
				Yaogan 17 Subsat 2	LEO	People's Liberation Army (PLA)	China Academy of Space Technology (CAST)	Remote Sensing			S
6-Sep-13	Minotaur V		WFF	LADEE	EXT	NASA	NASA	Scientific		S	S
12-Sep-13	Rockot		Plesetsk	Gonets M-05	LEO	Smolsat	Reshetnev Company	Communications		S	S
				Gonets M-06	LEO	Smolsat	Reshetnev Company	Communications			S
				Gonets M-07	LEO	Smolsat	Reshetnev Company	Communications			S
14-Sep-13	Epsilon Standard		Uchinoura	SPRINT-A	LEO	JAXA	JAXA	Scientific		S	S
18-Sep-13	Atlas V 531		CCAFS	Advanced EHF 3	GEO	DoD	Lockheed Martin Space Systems	Communications		S	S
18-Sep-13	✓ +	Antares 120	MARS	* Cygnus COTS Demo	LEO	Orbital Sciences Corp.	Orbital Sciences Corp.	Test	\$77.5M	S	S
23-Sep-13	Long March 4C		Taiyuan	Feng Yun 3C	SSO	China State Meteorological Administration	Shanghai Institute of Satellite Engineering	Meteorological		S	S
25-Sep-13	Kuaizhou		Jiuquan	Kuaizhou 1	SSO	China Aerospace Science and Industry Corporation (CASIC)	China Aerospace Science and Industry Corporation (CASIC)	Remote Sensing		S	S
25-Sep-13	Soyuz U2/Soyuz		Baikonur	Soyuz TMA-10M	LEO	Russian Federal Space Agency (Roscosmos)	RKK Energia	Crewed		S	S
29-Sep-13	✓ +	Falcon 9 v1.1	VAFB	Cassiope	LEO	Canadian Space Agency (CSA)	MacDonald, Dettwiler, and Associates Ltd. (MDA)	Development	\$56.5M	S	S
				6 secondary payloads (including cubesats)	LEO						S
30-Sep-13	✓	Proton M/Breeze-M	Baikonur	* Astra 2E	GEO	SES Astra	EADS Astrium	Communications	\$85M	S	S
25-Oct-13	Long March 4B		Jiuquan	Shi Jian-16	LEO	China - TBA	China - TBA	Development		S	S
25-Oct-13	✓	Proton M/Breeze-M	Baikonur	* Sirius FM-6	GEO	Sirius Satellite Radio Inc.	Space Systems/Loral	Communications	\$85M	S	S
29-Oct-13	Long March 2C		Taiyuan	Yaogan 18	SSO	China - TBA	China - TBA	Remote Sensing		S	S
5-Nov-13	PSLV Standard		Satish Dhawan	Mangalyaan (Mars Orbiter India)	EXT	ISRO	ISRO	Scientific		S	S
7-Nov-13	Soyuz U2/Soyuz		Baikonur	Soyuz TMA-11M	LEO	Russian Federal Space Agency (Roscosmos)	RKK Energia	Crewed		S	S

Date	Vehicle	Site	Payload(s)	Orbit	Operator	Manufacturer	Use	Comm'l Price	L	M
11-Nov-13	Proton M/ Breeze-M	Baikonur	Raduga-1M3	GEO	Russian Space Forces (VKS)	Reshetnev Company	Communications		S	S
18-Nov-13	Atlas V 401	CCAFS	MAVEN	EXT	NASA	Lockheed Martin Corp.	Scientific		S	S
			8 secondary payloads (including cubesats)	LEO						S
19-Nov-13	✓ + Minotaur I	WFF	STPSAT-3	LEO	U.S. Air Force	Ball Aerospace and Technologies Corp.	Development		S	S
			28 secondary payloads (including cubesats)	LEO						S
20-Nov-13	Long March 4C	Taiyuan	Yaogan 19	SSO	China - TBA	China - TBA	Remote Sensing		S	S
21-Nov-13	✓ Dnepr	Dombrovskiy	DubaiSat 2	SSO	ElAST	Korean Advanced Institute of Science and Technology	Remote Sensing	\$12M	S	S
			31 secondary payloads (including cubesats)	LEO						S
22-Nov-13	✓ Rockot	Plesetsk	Swarm 1	LEO	European Space Agency	EADS Astrium	Scientific	\$30M	S	S
			Swarm 2	LEO	European Space Agency	EADS Astrium	Scientific			S
			Swarm 3	LEO	European Space Agency	EADS Astrium	Scientific			S
25-Nov-13	Long March 2D	Jiuquan	Shiyan Weixing-5	SSO	China - TBA	China - TBA	Remote Sensing		S	S
25-Nov-13	Soyuz U2/ Progress	Baikonur	Progress M-21M	LEO	Russian Federal Space Agency (Roscosmos)	RKK Energia	ISS		S	S
1-Dec-13	Long March 3B	Xichang	Chang'e 3 (Lander and Rover)	EXT	China Academy of Space Technology (CAST)	China Academy of Space Technology (CAST)	Scientific		S	S
3-Dec-13	✓ + Falcon 9 v1.1	CCAFS	* SES-8	GEO	SES	Orbital Sciences Corp.	Communications	\$56.5M	S	S
5-Dec-13	Atlas V 501	VAFB	NRO L-39	TBD	NRO	TBA	Classified		S	S
			12 secondary payloads (including cubesats)	LEO						S
8-Dec-13	✓ Proton M/ Breeze-M	Baikonur	* Inmarsat 5-F1	GEO	Inmarsat	Boeing Satellite Systems	Communications	\$85M	S	S
9-Dec-13	Long March 4B	Taiyuan	CBERS 3/Ziyuan-1C	SSO	INPE	China Academy of Space Technology (CAST)	Remote Sensing		F	F
19-Dec-13	Soyuz 2.1b	Kourou	GAIA	EXT	European Space Agency	EADS Astrium	Scientific		S	S
20-Dec-13	Long March 3B	Xichang	* Tupac Katari	GEO	Bolivian Space Agency	China Great Wall Industry Corp. (CGWIC)	Communications		S	S
25-Dec-13	Rockot	Plesetsk	Cosmos 2488	LEO	Russian Space Forces (VKS)	Reshetnev Company	Communications		S	S
			Cosmos 2489	LEO	Russian Space Forces (VKS)	Reshetnev Company	Communications			S
			Cosmos 2489	LEO	Russian Space Forces (VKS)	Reshetnev Company	Communications			S
26-Dec-13	Proton M/ Breeze-M	Baikonur	Express AM-5	GEO	Russian Satellite Communication Co.	Reshetnev Company	Communications		S	S
28-Dec-13	Soyuz 2.1v	Plesetsk	AIST II	LEO	RKK Energia	RKK Energia	Development		S	S
			SKRL-756 1	LEO	Russia - TBA	Russia - TBA	Test			S
			SKRL-756 2	LEO	Russia - TBA	Russia - TBA	Test			S

V Denotes commercial launch, defined as a launch that is internationally competed or FAA-licensed, or privately financed launch activity. For multiple manifested launches, certain secondary payloads whose launches were commercially procured may also constitute a commercial launch.

+ Denotes FAA-licensed launch.

\* Denotes a commercial payload, defined as a spacecraft that serves a commercial function or is operated by a commercial entity.

L and M refer to the outcome of the Launch and Mission: S=Success, P=Partial Success, F=Failure.

Notes: All prices are estimates.

All launch dates are based on local time at the launch site.